Asia-Pacific
Economic Cooperation

2012/EMM10/004

APEC Low Carbon Model Town Project – China Development Report

Purpose: Information
Submitted by: China

APEC
RUSSIA 2012

10th Energy Ministers Meeting
St. Petersburg, Russia
24-25 June 2012

APEC

Asia-Pacific
Economic Cooperation

APEC Low Carbon Model Town (LCMT) Project China Development Report 2012

APEC

Asia-Pacific
Economic Cooperation

APEC
Low Carbon Model Town (LCMT) Project
China Development Report
2012

Asia-Pacific
Economic Cooperation

Preface

New prospects and challenges coexist in equal measure at the beginning of the 21st century. The economy in the Asia-Pacific region is gradually reviving and becoming ever more influential. However, it faces prominent challenges as regards the issues of meeting increasing energy demand and addressing climate change.

In November 2010, leaders of APEC economies gathered in Yokohama to discuss a more integrated approach to tackling these issues in the 21st century, around the theme of “Change and Action”. They put forward an APEC development strategy to build a low-carbon society, promote low-carbon policies and develop low-carbon industry. At the summit, Chinese President Hu Jintao delivered an important speech entitled “Deepen Mutually Beneficial Cooperation for Common Development.” Moreover, he proposed an initiative of “strengthening cooperation on low-carbon model town projects, promoting energy conservation and reduction of emissions, as well as strengthening cooperation on energy efficiency.”

In order to implement the guidelines laid down by APEC leaders’ summit and promote communication and cooperation among APEC economies, the China National Energy Administration conducted an investigation and research into China’s low-carbon town development. By conducting documentary research, consulting specialists, issuing questionnaires and engaging in other means of firsthand research, National Energy Administration completed this APEC Low-Carbon Model Town (LCMT) Project—China Development Report. It aims to explore methods of low-carbon development in APEC by sharing China’s concepts and experiences of low-carbon town development with other APEC economies.

China has always attached great importance to sustainable development and the efficient utilization of energy and resources. China has set sustainable development as a part of its national strategy and low-carbon development is an important part of this. Due to the unremitting efforts and commitment of the domestic community, China’s low-carbon town development has achieved spectacular progress, primarily across the following aspects: 1). A series of important policy measures have been put forward, such as promoting energy conservation and reduction of emissions, addressing climate change and developing low-carbon towns; 2). Low-carbon energy technology develops fast. China has extended great efforts as regards energy conservation and emissions reduction. Use of new energy and renewable energy has grown dramatically; 3). A model with Chinese characteristics has been formed on the theory of low-carbon town development and the way to progress going forward; 4) Pilot projects involving low-carbon model town have been expanded from specific areas nationwide; 5). A number of best practices guidelines as regards low-carbon town development based on this model have emerged; 6). Deeper international cooperation has greatly promoted low-carbon town development.

Based on the practices and experience of China’s low-carbon town development, we have attempted to collate a few initiatives applicable to low-carbon town development in APEC economies. We hope that we might provide support for APEC economies on researching low-carbon town development and implementing related measures. These initiatives are as follows:

1). Polices on both national and local levels are of great importance to low-carbon town development, including those addressing climate change, energy conservation, reduction of emissions and promoting low-carbon town

development.

2). Sustainable urban development is the basic premise and fundamental purpose of low-carbon town development. Low-carbon town development pursues the reduction of carbon emission while incorporating the multiple benefits of sustainable development, such as economic development, improvement in the living standards, environmental protection and resource conservation, etc.

3).There are six key elements of low-carbon town development, namely, low-carbon industry, low-carbon layout, low-carbon energy, low-carbon building, low-carbon transportation and resources recycling. These can be used comprehensively according to the characteristic of a particular town. Although low-carbon strategies involving energy, building and transportation are the cornerstones of international practice to adjust energy structure and improve energy efficiency, low-carbon industry and layout are also of great importance for developing economies undergoing the large-scale economic infrastructure construction necessary to develop low-carbon towns.

4). International cooperation can promote low-carbon town development. Therefore, cooperation among APEC economies on low-carbon town development should be further enhanced.

On the whole, China's town development is blessed with excellent opportunities. China has strong aspirations to continue to deepen cooperation and to achieve mutual and multilateral cooperation benefits and win-win situations via the platform of APEC. In the meantime, China also looks forward to making a positive contribution utilizing our own unique advantages to promote exchange and cooperation across APEC on a higher level.

Asia-Pacific Economic Cooperation

Contents

Asia-Pacific
Economic Cooperation

I.Overview of China's Low-carbon Town Development

In recent years, China has experienced rapid development in the areas of industrialization, urbanization and mobilization, resulting in the fast growth of energy consumption and carbon emissions. Urbanization has led to China's population, economy and transportation congregating in urban areas, which are also becoming the main areas of energy consumption and carbon emission in China.

In order to actively address global climate change, the Chinese government has already issued a series of policies and measures, progressively promoting the development of low-carbon model town projects, which are widely welcomed and positively embraced by local governments. So far, dozens of cities in China have carried out low-carbon model town projects.

1. Fast Growth of Energy Consumption in China

With a big population of 1.3 billion, China is the biggest developing country experiencing this process of industrialization, urbanization and mobilization (Chart 1-1). Coal plays a central role in the structure of primary energy consumption (Chart 1-2). Total energy consumption is growing at a tremendous rate.

Driven by the rapid development of industrialization, urbanization and population mobilization, energy consumption in China has increased by nearly 180 million tons of standard coal per year between 2000-2010. The consumption of fossil fuel energy has increased by nearly 160 million tons of standard coal per year. (Chart 1-3)

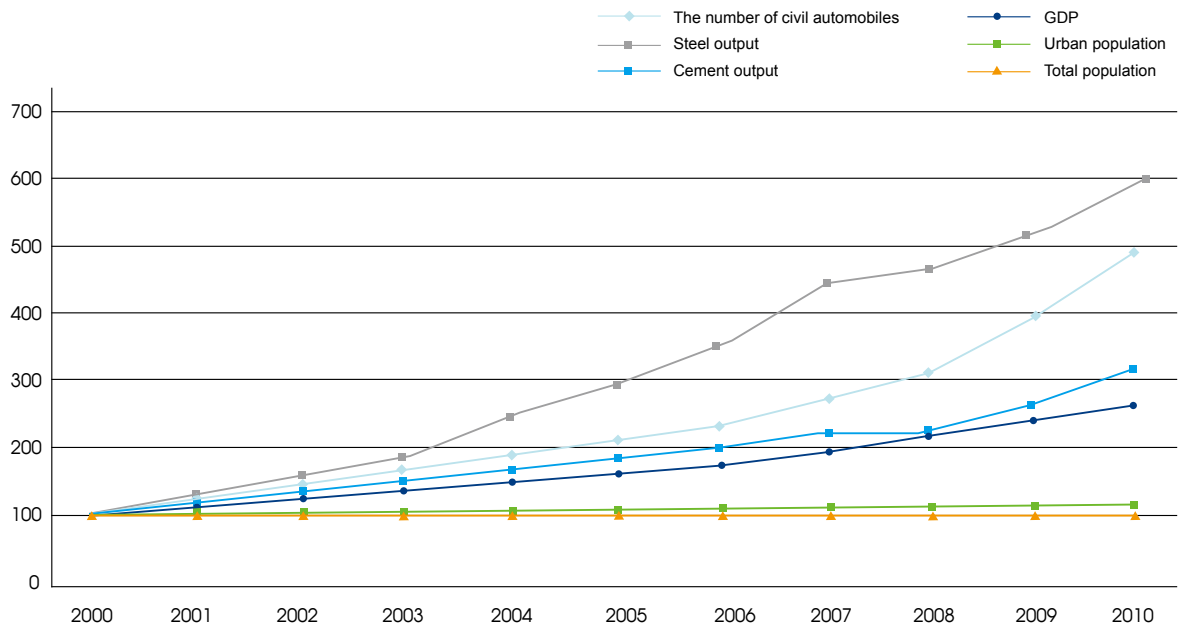

Chart 1-1. Schematic Diagram on China's Industrialization, Urbanization and Mobilization.
(Source: National Bureau of Statistics of China, 2011)

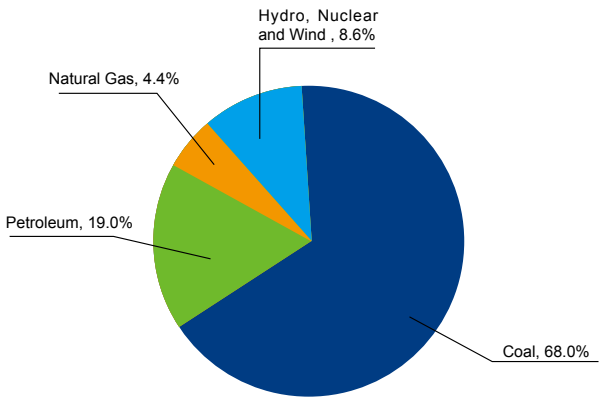

Chart 1-2. Primary Energy Consumption Structure in China, 2010
(Source: National Bureau of Statistics of China, 2011)

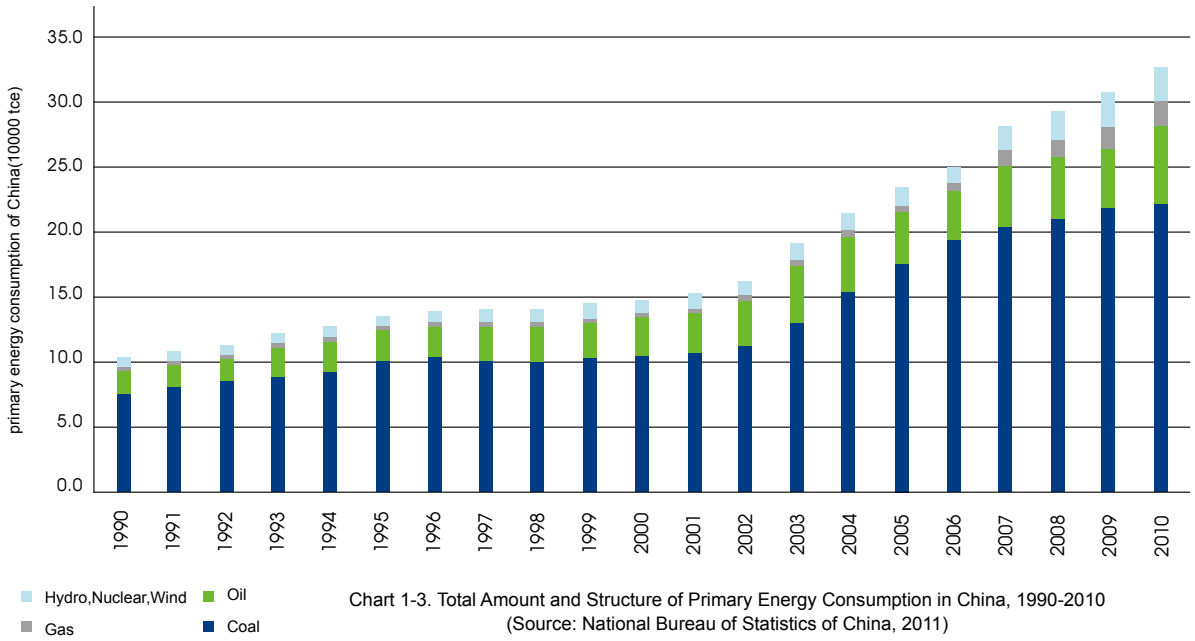

Chart 1-3. Total Amount and Structure of Primary Energy Consumption in China, 1990-2010
(Source: National Bureau of Statistics of China, 2011)

2. The Accelerated Development of Urbanization in China

China has entered a stage of accelerated development of urbanization (Chart 1-4). The urbanization rate has reached 49.68% and the urban population now stands at 0.666 billion. China now has 657 cities (administratively designated as cities), 1,578 counties (including autonomous counties) and 19,410 towns. During 2000-2010, the urbanization rate has on average increased by 1.36% per year and urban population has increased an average 20.17 million per year.

During the process of such rapid urbanization, China has formed three big urban-intensive areas: the Yangtze River Delta, Pearl River Delta and Beijing-Tianjin-Hebei, as well as other large urban areas such as the central and southern part of Liaoning Province, central China, the Shandong Peninsula, Wuhan, Changsha-Zhuzhou-Xiangtan, Chengdu-

Chongqing, the central Shanxi plain-Tianshui, southern and eastern Fujian Province and the Northern Gulf rim areas. Centered on one or more cities and composed of many towns, the city-agglomeration areas and urban areas have greatly promoted the development of local economies and society and given full play to their role as a driving force, so as to promote the development of other areas.

On one hand, rapid urbanization has enhanced China's social and economic development; on the other hand, it leads to energy consuming elements such as population, economy and transportation being concentrated in urban areas, which have in turn become the main sources of carbon emissions.

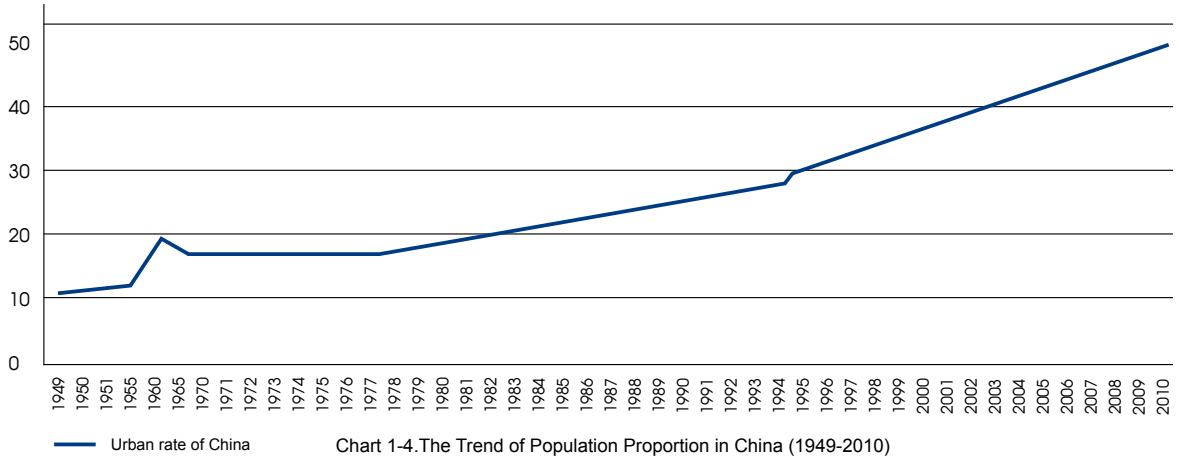

Chart 1-4.The Trend of Population Proportion in China (1949-2010)
(Source: National Bureau of Statistics of China, 2011)

3. Chinese Government Addresses Climate Change Actively

Climate change is a significant global challenge. The Chinese government attaches great importance to climate change while promoting modernization, and has made great efforts to tackle it. China developed and implemented its National Climate Change Program at a very early stage. The country has made great strides as regards energy conservation and the reduction of pollutant emissions, and has also forged ahead on new and renewable energy.

Column 1. Process of China's Main Policies on Addressing Climate Change

- 2006.12: National Assessment Report of Climate Change was enacted by NDRC and other five ministries.
- 2007.06: The State Council issued China's National Climate Change Program and established the National Leading Working Group on Addressing Climate Change, Energy Saving, and Emission Reduction.
- 2008.10: The State Council issued China's Policies and Actions on Climate Change White Paper.
- 2009.09:President Hu Jintao delivered a speech on Addressing the Climate Challenge at the United Nations Summit on Climate Change
- 2011.03:It's proposed that during the 12th five-year plan period, carbon dioxide emissions per unit of GDP should be reduced by 17% and the proportion of non-fossil fuels in primary energy consumption should increase to 11.4%.

In the 1990-2005 period, China's carbon dioxide emissions per unit of GDP were reduced by 46% and the proportion of non-fossil fuels in primary energy consumption increased from 5.1% to 6.8%. The Chinese government further put forward objectives that carbon dioxide emissions per unit of GDP should be reduced by 40%-45% by 2020 on the basis of 2005 levels and the proportion of non-fossil fuels in primary energy consumption should reach 15% (Chart 1-5). The targets have been included in the national economic and social development plan as binding objectives. China's 12th Five-Year Plan for National Economic and Social Development put forward that by 2015, carbon dioxide emissions per-unit GDP would be reduced by 17 percent on the basis of 2010; the proportion of consumption of non-fossil energy to the consumption of primary energy would be increased to 11.4%.

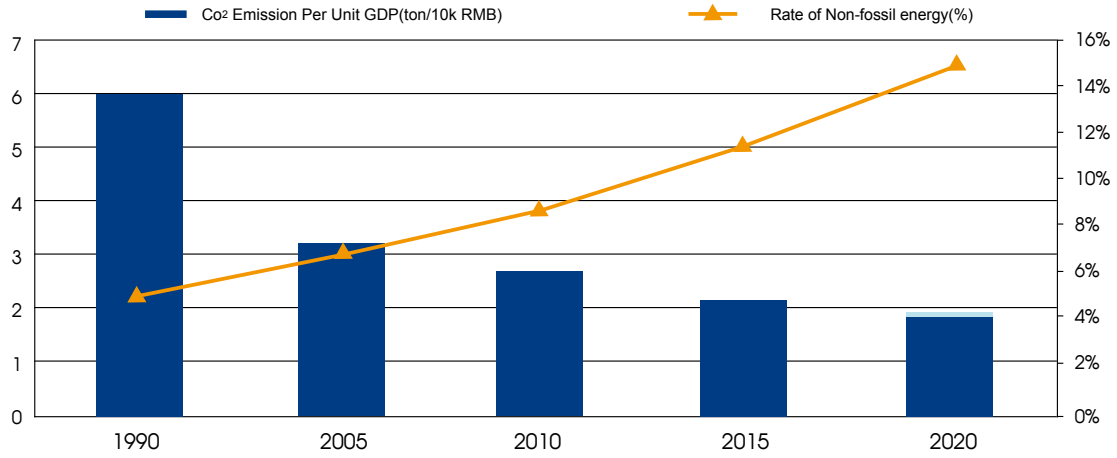

Chart1-5. During 1990-2020, China's Carbon Dioxide Emissions Per Unit of GDP
and the Proportion of Non-fossil Energy Consumption to Primary Energy Consumption
(Source: National Bureau of Statistics of China, 2011; Xinhua News Agency, 2011; BP, 2011)

4. China's Low-carbon Town Development is at a Stage of Big Scale Pilot Project Across the Country

China's urban areas are the main sources of energy consumption and carbon emissions. Therefore, developing low-carbon towns has become a significant part of addressing climate change in China. In recent years, China's low-carbon town development has made significant progress through the combination of sound central government policies, local government initiatives and active international cooperation.

In terms of central government's policies, from 2005, the Ministry of Housing and Urban-Rural Development (formerly the Ministry of Construction) enacted a series of policies and measures to promote the development of public transportation and low-carbon building, and began to carry out the low-carbon model town program. In July 2010, the National Development & Reform Commission issued the Notice of the Development of Low-carbon Provinces and Low-carbon Cities Pilot Projects and officially instigated a program of low-carbon provinces and cities in five pilot provinces and eight pilot cities. In the Notice of National Plan for Development of Priority Zones issued in December 2010, the State Council declared tit would build low-carbon cities and reduce greenhouse gas emissions. In Opinions of the State Council on Implementing the Arrangement of Major Departments in Accordance with the Report on the Work of the Government issued in March 2011, the State Council again put forward the idea of promoting low-carbon pilot cities. In its Renewable Energy Development Plan for the 12th Five-Year Period, it was proposed to establish 100 new energy cities by 2015 and to comprehensively support the utilization of renewable energy such as solar energy, bio-energy and geothermal energy in cities. In addition, other ministries and local governments also responded actively and widely to China's low-carbon town development with relevant or supporting policies and measures. (Column 2)

Column 2. Some Polices and Measures of China's Low-carbon Town Development

The State Council and NDRC
● 2010.07: NDRC issued the Notice of the Development of Low-carbon Provinces and Low-carbon Cities Pilot Projects and officially put forward the work of Low-carbon provinces and cities in 5pilot provinces and 8 pilot cities.
● 2010.12: In the Notice of National Plan for Development of Priority Zones, the State Council declared to build Low-carbon cities and reduce greenhouse gas emissions.
● 2011.03: The State Council put forward the idea to promote Low-carbon pilot cities in the Opinions of the State Council on Implementing the Arrangement of Major Departments in Accordance with the Report on the Work of the Government
Other Ministries: MOHURD (former MOC), MOST, MOEP
● 2005.09: Guidelines of Giving Priority to the Development of Urban Public Transport by MOHURD, NDRC, MOST, MOPS, MOF, MLR
● 2006.03: Evaluation Standard for Green Building by Ministry of Construction
● 2006.09: Implementation Opinion on Accelerating the Deployment of Renewable Energy in Building by Ministry of Construction and Ministry of Finance
● 2006.12: Opinion on the Economic Policy of Giving Priority to the Development of Urban Public Transport by Ministry of Construction, NDRC, MOF and MOHRSS
● 2010.01: Framework Agreement on National Low-carbon Ecological Model City by MOHURD and Shenzhen Municipality
● 2010.07: Cooperation Framework Agreement on National Low-carbon Ecological Model Zone--Wuxi Tai Lake New City by MOHURD and Wuxi Municipality
● 2011.01: Notice on Forming MOHURD Low-carbon Eco-city Construction Leading Group
● 2011.06: In the 12th Five-Year S&T Development Plan on National Environment Protection by Ministry of Environmental Protection, it was proposed to research technologies like management and performance evaluation of building resource thrift and environment friendly cities.
● 2011.07: MOST issued Notice on S&T Development Plan during the 12th Five-year Period to develop Low-carbon town plan, green building design, energy conservation in building and Low-carbon and harmonious model community.
● 2011.07: Temporary Measures on Declaration and Management of MOHURD Low-carbon Ecological Pilot City (Town) by MOHURD
Local Government
● 2009.12: Decision on Building Low-carbon City by Hangzhou, Zhejiang Province
● 2010.01: Work Plan on Building Low-carbon City by Chengdu, Sichuan Province

- 2010.05: Construction Plan on Low-carbon City by Xiamen, Fujian Province
- 2010.08: Notice on Selecting Areas as Low-carbon Pilot Development by Shanghai
- 2010.10: Opinions on Building Low-carbon City by Baoding, Hebei Province

Upon the promotion of the central government's policies and local governments' active practices and international cooperation, China's low-carbon cities have developed from a handful of pilot projects at an early stage to large-scale pilot projects all over the country in a couple of years (Chart 1-6). Figure 1-1 lists an overview of some low-carbon cities' development in China. In addition to the listed cities and regions, other areas like Suzhou, Lianyungang and Changsha-Zhuzhou-Xiangtan are also beginning to undergo low-carbon development.

Chart 1-6. China's low-carbon model town distribution diagram

Table 1-1. List on China urban low-carbon practice

Category	Region	Slogan or Principa Lline	Practice
China's low-carbone conomic cooperation projects (NDRC)	Chongqing	Explore low-carbon economic pilot program and gain experience soas to spread throughout the country	Planning the Low-carbon Industrial Park at Yangtze River and Jialing River; attracting Low-carbon industry to set up here and develop
	Nanchang		Promoting the establishment of the Eco-economic Zone of Poyang Lake and the "Six-One" project of technology innovation
	Baoding		Exploring how to develop after the establishment of Electricity Valley and Solar Energy City
	Guangdong		Completing the greenhouse gas emission list; exploring a mature method of organization; promoting Guangdong economy turning into low-carbon economy
	Hubei		Realizing region and industry cooperation; establishing Wuhan Steel Metallurgical Corridor, Yichang-Jingmen Chemical Industry Area, Xiangfan-Shiyan Automobile Industry Area, Tianxian-Qianjiang Light Industry Area and Western Hubei Ecological Area and Carbon Sink Base
National Low-carbon Action Pilot Project	11 cities	Cool China— National Low-carbon Action in 2009	11 cities, including Tianjin, Shanghai, Xi'an, Yinchuan, Nanjing, Changzhou, Suzhou, Guangzhou, Xiamen, Shenyang and Chongqing, make an initiative of low-carbon life style and raise citizens' awareness of energy conservation and emission reduction.
The first low-carbon economy demonstration zone (NDRC)	Jilin	Low-carbon economy transformation of old industrial base	Attach great importance to national industrial development policy and advance resource recycling. Chinese Academy of Social Sciences published new standard system of low-carbon city evaluation. Jilin City becomes the first city that accords with the system in the northeastern of China.
Sino-UK Low-Carbon City Pilo (MOST and Research Councils UK)	4 pilot cities	Introduce the advanced idea and technologyof international low-carbon urban establishment	The first Sino-UK low-carbon pilot cities include Guangzhou, Minhang District in Shanghai, Xi'an, and Xixia County in Nanyang City. It is aimed to introduce the advanced idea and technology of international low-carbon urban establishment and give a scientific instruction to China's low-carbon urban construction pilots.
Climate Neutral Network member	Rizhao	Build the real city that uses solar energy	Make low- carbon as the main theme during the 12th Five-year plan; the popularization rate of solar water heater per district reach 99%; public lighting equipment adopts the solar power generating technology; thermal greenhouse with more than 60,000 square meters using solar energy absorber plate to preserve heat; solar energy hearth and thermal greenhouse in warm-winter style fully utilize solar energy.

Other low-carbon practice	Zhuhai	Ecology priority GDP	Establish Oriental Villa's No.1 Residence of Low-Carbon Building Cluster Demonstration Base; Hengqin Island wind power plant project: Dan'gan Island will set up first island power plant of renewable independent power in the world that comprehensively use solar power, wind power and wave power Tianjin.
	Tianjin	UN looks forward to building a low-carbon economic development center in Tianjin.	The planned new Tianjin Eco-city will fully use clean energy and establish 100% green building by 2020. The utilization rate of renewable energy will reach 20% by 2020. Binhai New Area will spend 14 billion in establishing low-carbon industries around 6 main projects in the next two years. Tianjin Carbon Emission Exchange was founded.
	Hangzhou	Low-carbon industry and low carbon city	It takes the lead in building low-carbon industry and low-carbon city in the country and begins to plan and build Hangzhou Low-carbon Museum. It also takes the lead in developing public bicycle transportation system.
	Beijing	Green Beijing	It inherits the legacy of Green Olympics and intends to carry out the low-carbon plan.
	Chengdu	Low-carbon life and industry	Bulid Zero-carbon Tourist Industry Demonstration Area; carry out Free Bicycle action firstly in the new southern area; encourage citizens to make a low-carbon transport.
	Nanning	Strength carbon sink	Try to win the title of National Forest City; forest output value should break 20 billion RMB
	Shenzhen	Low-carbon industry	Bao'an District in Shenzhen is selected as the venue of the first low-carbon economic production demonstration and exchange center in China. Government cooperates with BYD to promote new energy automobile development.
	Wuxi	Low-carbon City with Contribution in China	The goal of building the four-function city is eco-city, hi-tech industry city, tourist and modern service city and living-friendly city. It should be emphasized on source control, comprehensive treatment, green economy and low-carbon city.

The survey (including 72 effective questionnaires) investigates and researches the latest situation of low-carbon town development all over the country. It shows that a majority of cities (92%) have begun to carry out related projects and most cities (72%) have raised emission-reduction targets. It also shows that 81% cities have issued low-carbon policies.

The survey classifies cities as comprehensive style, resource style, industry style, agriculture style (industry mainly focuses on agricultural production, process and other affiliated industries) and tourist style. Of those, most cities that plan to develop low-carbon town projects are comprehensive-style cities. Industry style, agriculture style and resource style are in second place (Chart 1-7). When properly implemented, comprehensive cities are relatively optimistic as regards the economic and social benefit resulting from low-carbon development. Thus, they respond actively to the low-carbon development initiative.

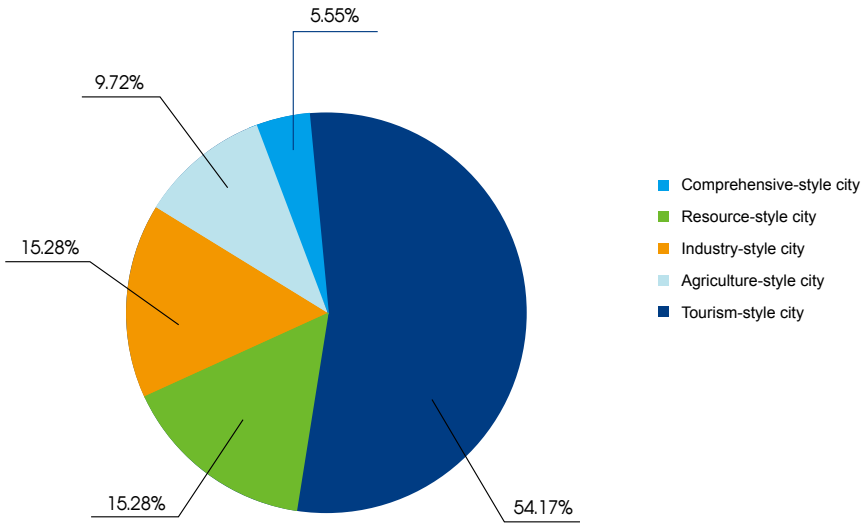

Chart 1-7. City-Style Distribution of Low-carbon Town Building in China

II. Concept of Low-carbon Town Development in China

Low-carbon town development has become an important concept and feature of the new round of China's town development. Through town practices and theoretical exploration in recent years, China has formed its own understanding of the concept and has formulated a way of realizing low-carbon town development with Chinese characteristics.

1. Main Characteristics of China's Low-carbon Town Development

As mentioned previously, China is standing at a special stage of economic and social development, incorporating dynamic development, large-scale reconstruction projects and consumption upgrading. The majority of cities' energy consumption and carbon emissions keep growing fast. Energy consumption and carbon emissions as a consequence of construction occupy the majority and accounts for 80% to 90% of national totals. Meanwhile, in the process of rapid urbanization, China's cities face various conflicts in the area of sustainable development in such areas as resources, environment, economy and society, amongst others.. For instance, aside from climate change and carbon emission reduction, serious normal environmental pollution remains a significant problem for most cities attempts to develop sustainably.

Therefore, compared to developed economies and regions, although China's low-carbon town development also emphasizes the implementation of the goal and strategy of carbon emission reduction, it mainly focuses on how to reduce carbon emissions in development and to coordinate with other goals of sustainable development, rather than to purely pursue the absolute total amount of carbon emissions in the short term.

The main characteristics of China's low-carbon town development can be concluded in the following three points. These characteristics lead to the fact that China's concept and way to realize low-carbon town development is different from that of developed economies, which have already realized industrialization.

- First, we take sustainable development as the basic concept and emphasize reducing carbon emissions in development, such as reducing the carbon emissions per unit of GDP. Meanwhile, we emphasize coordination between carbon emissions reduction and sustainable development such as normal pollution emissions reduction and economic development.
- Second, we emphasize industrial sustainable development, infrastructure layout and reduction of energy consumption in construction in order to establish a final low-carbon economic structure and a low-carbon life style, avoiding wasteful energy consumption in production and construction (industrial overcapacity) resulting from redundant, irrational and excessive construction in development, and energy consumption waste resulting from irrational orientation of energy service.
- Third, we emphasize minimizing accumulative carbon emissions in the life cycle of primary urban infrastructure construction, operation and retirement, such as the widespread use of advanced technology, consistently improving management and promoting recycling of the retired facility and waste resources.

2. Basic Concept—Sustainable Development as Foundation

Like the concepts behind eco-cites and energy-conservation cites in the process of China's urbanization, low-carbon cities are also based on sustainable development and incorporate sustainable construction. However, low-carbon cities focus more on energy supply and the environmental impact of urban systems. (Chart 2-1)

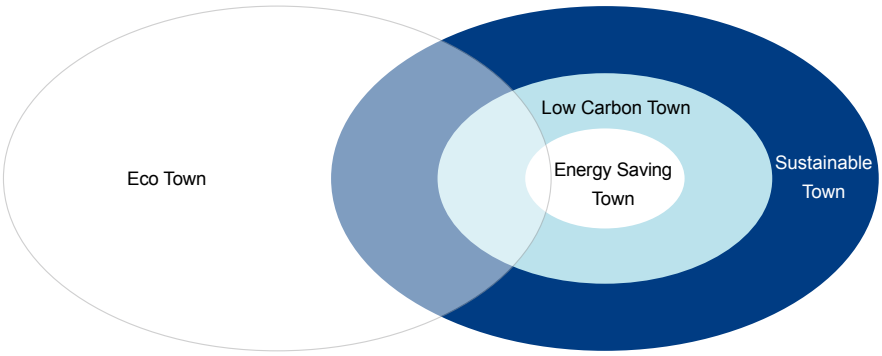

Chart 2-1. The relationship between China's low-carbon towns, sustainable cities and related concepts

If we ignore urban sustainable development as a fundamental aim and just focus on the reduction of carbon emissions, it is likely to result in large carbon emissions over the life cycle of the entire urban system. In other words, China's low-carbon town development not only pursues carbon emission reduction, but also emphasizes the multi-benefits of sustainable development in the process, such as economic development, living standards improvement, environmental protection and resource conservation, etc.

Therefore, China's low-carbon town development takes sustainable development as a basic framework, emphasizing the realization of low-carbon emissions in various areas like urban production, lifestyles, transportation, society, resources and environmental sustainable development.

- Production perspective: sustainable and low-carbon economy
- Transportation perspective: sustainable and low-carbon transportation
- Lifestyle perspective: good housing and living environment; low-carbon building and facilities
- Social perspective: public involvement, social justice, cultural and wisdom continuity, low-carbon outlook and lifestyle
- Natural resource perspective: simple but efficient land use, minimal resource consumption
- Eco-environmental perspective: minimal pollution and waste emission, sustainable eco-systems

3. Main Approaches—Industry, Layout, Energy, Building, Transportation and Recycle

According to the practices of China's cities and towns, the main approaches of China's low-carbon town development can be summarized in these six areas: low-carbon industry, low-carbon layout, low-carbon energy, low-carbon building, low-carbon transportation and resource recycling. (Chart 2-2).

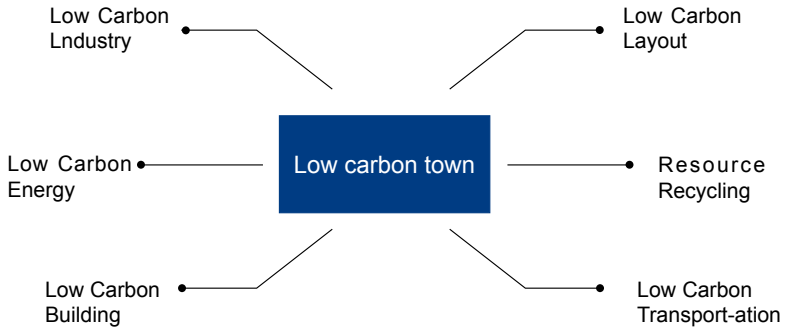

Chart 2-2.
Diagram of main approaches to realize China's low-carbon town development

1). Low-carbon Industry

We should promote and provide guidance for the establishment of low-carbon production. On one hand, it includes industrial plans at the beginning of urban establishment as well as the adjustment and upgrading of existing industrial structure in the later stage, such as developing hi-tech industry and tertiary industry and phasing out old production facilities that have high energy consumption and emissions. On the other hand, we should restrict, guide and promote the performance of carbon emissions both in primary industry and services. Special attention should be paid to industrial energy conservation and emissions reduction so as to use the same amount or lower energy consumption and carbon emissions to create more added value across the production and service sectors.

2). Low-carbon Layout

This mainly guides and realizes the reduction of total transportation demand, particularly that of automobile transportation, and the increase of public transportation through the optimal use of space and related city functions. It also includes avoiding energy consumption waste resulting from excessive, redundant and irrational infrastructure construction through careful design and management. By optimizing infrastructures like energy and water treatment, energy efficiency should be increased and energy consumption should be reduced.

3). Low-carbon energy

We should develop and use new low-carbon energy technology to improve primary energy structure, increase energy supply efficiency, and reduce fossil energy consumption and carbon emissions.

4). Low-carbon building

Appropriate materials, design and technology deployed in newly constructed buildings with good management and operation can reduce the energy consumption of the building, the energy facilities and systems within it.

5). Low-carbon transportation

Advanced technology and management techniques, promotion of low-carbon travel, development of public transportation, improvement of fuel efficiency and development of new energy vehicles can reduce the energy consumption and carbon emission involved in transportation.

In China's low-carbon town development, it is of great importance to guide people to adopt low-carbon consumption with the goal of living a low-carbon lifestyle. However, without a specific summarization, the investigation and research mainly reflect low-carbon journeys.

6). Resources recycling

After the retirement of primary civil, municipal and industrial facilities, the recycling of facilities and resources shall be enhanced. We could also enhance waste recycling and the development of the resources recycling industry.

III. Practices on China's Low-carbon Town Development

China has numerous practices related to low-carbon town development and a number of best practices with distinctive characteristics have emerged. The following is a description of some of the typical practices in the context of the six main approaches to realizing low-carbon town development. There are 17 practices in 14 towns around China, which are as shown in Chart 3-1:

Chart 3-1 Township Distribution of Best Practices on China's Low-carbon Town Development

1. Low-carbon Industry

Industry is a major driver of energy consumption in Chinese cities and towns, while it is one of the main functions of these cities and towns to provide external economic services through its industry development. Thus, low-carbon industry is essential to low-carbon town development. Particularly where integrated, resources-based and industry-based cities and towns are concerned, a significant amount of energy consumption and emissions originate from mining, processing and manufacturing industries within industrial park areas. It is key for these cities and towns to realize energy conservation and emission reduction goals to restrict or phase out highly energy-intensive and high-emission industries, while developing high value-added and low-emission high-tech industries and services.

As is shown in Table 3-1, all the provinces and towns in China have formulated energy saving plans in accordance with China's 12th Five-Year Plan, which explicitly sets binding policy indicators for reducing energy intensity and emissions per unit of GDP. In the five provinces and eight cities selected as low-carbon model town pilot areas, some set even more ambitious goals as shown in Table 3-2. These goals of energy conservation and emission reduction will vigorously promote the development of low-carbon industries in the provinces and cities.

Table 3-1
Energy-conservation targets for the 12th Five-Year Plan period set by the provincial and municipal governments

Reduction in Energy Intensity Per Unit of GDP by Percent	Provinces and Municipalities
18%	Tianjin, Shanghai, Jiangsu, Zhejiang, Guangdong
17%	Beijing, Hebei, Liaoning, Shangdong
16%	Shanxi, Jilin, Heilongjiang, Anhui,Fujian, Jiangxi, Henan, Hubei, Hunan, Chongqing, Sichuan, Shanxi
15%	Inner Mongolia, Guangxi, Guizhou, Yunnan, Gansu, Ningxia
10%	Hainan, Xizang, Qinghai, Xinjiang

Table 3-2
Carbon Emission Reduction Plans Set by Some of the Selected 5 Provinces and 8 Cities

Name	Targets in 2015			Targets in 2020		
	Reduction of CO_2 Emissions Per Unit GDP (%)	Portion of Non-fossil Energy in Energy Structure (%)	Forest Coverage Rate (%)	Reduction of CO_2 Emissions Per Unit GDP (%)	Portion of Non-fossil Energy in Energy Structure (%)	Forest Coverage Rate (%)
Guangdong	35	19	57.5	Above 45	23	59-60
Chongqing	35	13	43	45	15	Above 45
Nanchang	32	7	24	45	15	28
Hubei	35	16	41	45	22	44
Baoding	35			48		Above 25
Yunnan	Above 30	Above 2	Above 53	Above 40	Above 30	56
Tianjing	36			44		
Shenzhen				Above 45		
Hangzhou				50		

China's industrial energy efficiency and emission reduction policies greatly boost the development of urban low-carbon industries. For example, the NDRC, together with four other ministries jointly issued the Implementation Plan of Energy Conservation Action for 1,000 Enterprises, which clearly sets the energy conservation goal of 100 million tons of standard coal equivalent from 2006 to 2010. In the Notification on Issuing "Comprehensive Program of Energy Conservation and Emission Reduction" released in May 2007, the State Council proposed 45 measures concerning energy conservation policies in 10 areas and established an accountability system on the government's work in energy conservation and emission reduction. Also in 2007, the NDRC issued the Implementation Plan of Energy Efficiency Benchmarking for Key Energy Consumption Enterprises, selecting the industries of steel, caustic soda and cement for pilot energy efficiency benchmarking.

The survey shows that although in some special circumstances the development of low-carbon industry might impact urban economic growth in the short term; however, it will be favorable for the urban sustainable development in the long run. For example, as the survey shows, in order to transfer to a low-carbon development path, some cities and towns which lag behind with undiversified economic structure need to phase out, close down or upgrade outdated production facilities in the short term. This might slow down their economic growth, but with the completion of industrial restructuring and upgrading, those cities and towns can acquire vast room for growth by focusing on the layout of energy-conservation

and environment-protection industries and industrial categories with distinctive low-carbon economy features, such as complete sets of pollution abatement equipment, energy conserving products and new energy resources, etc.

Case 1: Industrial Restructuring -- Shijingshan District's Relocation of Shougang Group to Hebei Province and Development of Service Industry

As one of Beijing's eight districts, Shijingshan district used to be home to many heavy industry enterprises, high-technology companies and sports centers. Now with the industrial restructuring and upgrading (Chart 3-2) during the 11th Five-Year period, Shijingshan district now has been repositioned as a cultural recreation area.

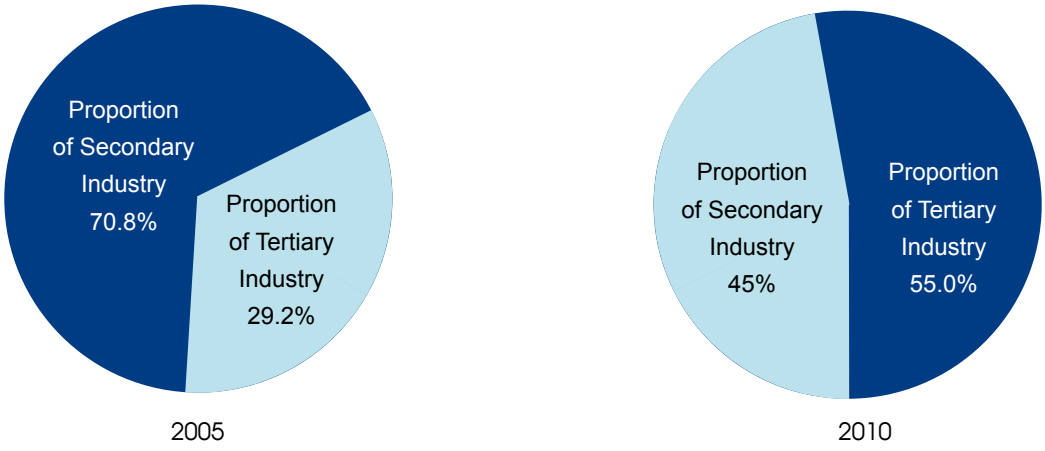

Chart 3-2 Comparison of the Proportions of the Secondary and Tertiary Industries Respectively in 2005 and 2010

As one of its important industrial readjustment measures, Shijingshan district completed the relocation of Shougang Group, once its biggest heavy industry enterprise. As a large enterprise group with steel as its main business, Shougang group contributed to about half of Shijingshan district's total fiscal revenue in 2007. However the group caused the following serious problems. Firstly, with its severe pollution emission, Shougang Group was the major emission source of Shijingshan district as well as of Beijing (Chart 3-3). Secondly, its enormous water consumption further stressed the water supply of Beijing. Thirdly, Shougang Group did not fit in Beijing's overall development strategy, which was to focus on fostering service industry and high-end manufacturing industry. Finally, with its huge demand for iron ores and coke transported from other areas, it placed a great burden on the transportation system of Beijing.

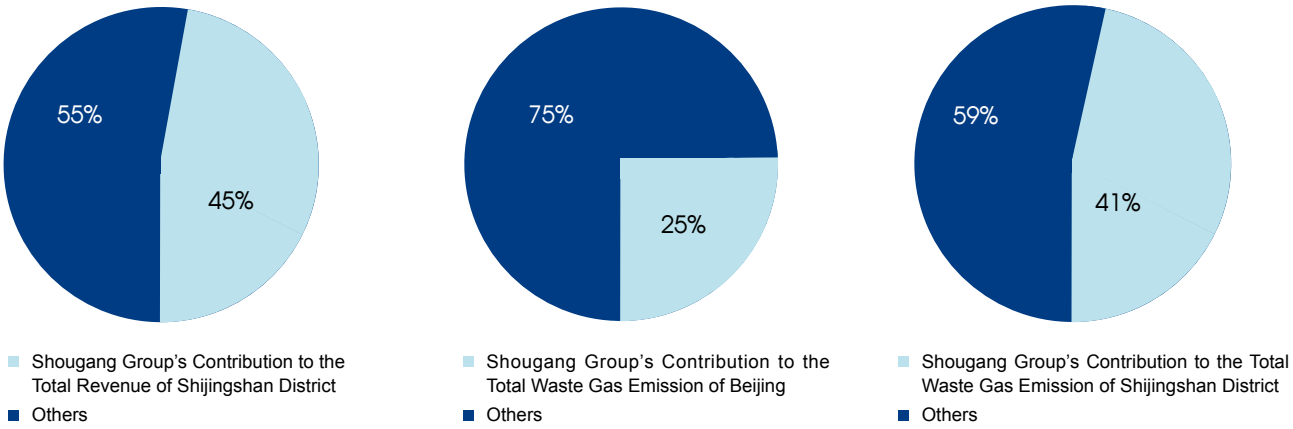

Figure 3-3 Shougang Group's Contribution to the Total Revenue of Shijingshan District, and to the Total Waste Gas Emission of Beijing and That of Shijingshan District (%)

In 2005, the State Council approved a plan for Shougang Group to phase out its operations and relocate. By the end of 2010, the Group completed the relocation of all heavy energy-intensive operations and only its headquarters and R&D department remain in Beijing.

Other than that, Shijingshan district took a series of measures to readjust its industrial structures (Chart 3-4), e.g. greatly developing its service industry. Thanks to these efforts, its original industry-dominant industrial system has been transformed into a modern service-dominant one, with cultural and creative industries, high-tech, business services, modern finance, and tourism and leisure as its new leading industries.

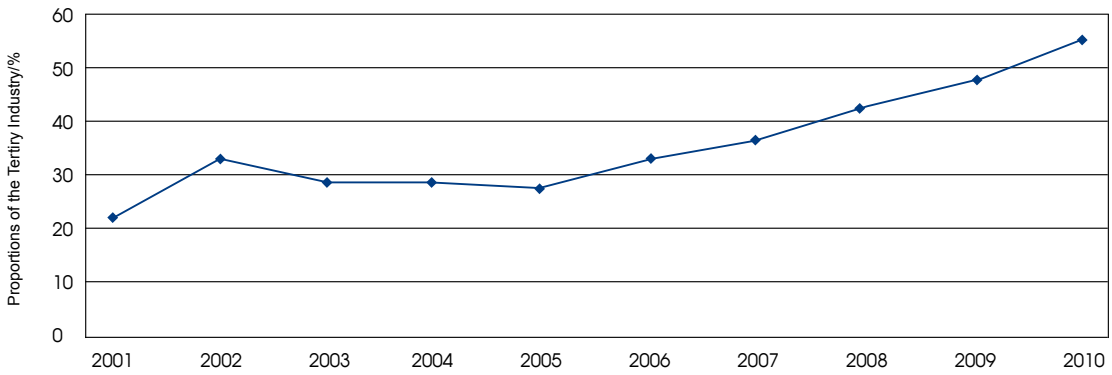

Chart 3-4 Share of Shijingshan District's Service Industry in its Economy From 2001 to 2010

Case 2: Industrial Restructuring— the Transition of the City of Jilin, an Old Industrial Base

As a famous industrial base located in Northeast China, the city of Jilin used to have heavy vehicle, chemicals, steel and petroleum as its main industries. Thanks to its industrial restructuring in light of local conditions, the city has developed a pattern of diversified industries and significantly reduced its overall energy consumption, and thus carbon emission intensity. For example, the city now capitalizes on its rich forest resources, and is vigorously developing its agricultural product processing industry and bio-pharmaceutical industry. With its rich mineral resources and solid industrial manufacturing foundation, the city develops high-tech industries such as electronic information and track passenger trains (Chart 3-5). The city of Jilin has achieved a sound industrial structure by promoting the upgrading of it traditional industries and speeding up the development of emerging industries.

Case 3: Industrial Structure Upgrading--the Transition of Datong, the Coal Capital in Shanxi Province

Known as China's coal capital for its rich coal reserves, Datong used to be a resource-based city. Facing problems such as high-quality coal exhaustion and environmental degradation, Datong achieved an economic transition by upgrading its industries and developing a circular economy.

Datong used to be a mere coal-producer and now has become a coal product supplier that turns coal into electricity and coal-based clean energy products. Datong has established a new system of high value-added products with coal as its basis and electricity, energy alternatives and petrochemical alternatives as primary offshoots. Meanwhile, Datong is proactively developing its resource recycling industries (Chart 3-6). For example, gangue walling materials and top-grade architectural glass made from waste gangue; methanol and synthetic ammonia made from coke oven gas; and cement and hollow bricks made from slag and coal ash.

Chart 3-5 Test Run of a Bullet Train Manufactured in Jilin

Chart 3-6 Datong Coal Mine Group's Tanshan Circular Economy Park

Case 4: Corporate Carbon Emission Performance-- Energy Conservation of Anshan Iron and Steel Group Located in Anshan, Liaoning Province

As China's second largest state-owned steel company, Anshan iron and steel group (Ansteel) provides a revenue source for Anshan city but is also a major energy consumer and carbon emitter as a result of its iron and steel output of more than 30 million tons. In 2006, Ansteel joined the 1,000 Enterprises Energy Conservation Action initiative and pledged to conserve energy of 2 million tons of standard coal equivalent during the period of the 11th Five-Year Plan.

In order to achieve it energy conservation goal, Ansteel massively upgraded its technologies,eliminated a large amount of inefficient energy-intensive equipment and built efficient energy-conserving facilities (Chart 3-7 left). Ansteel has also now adopted the most advanced compact, large-scale and short-process processing lines in the world, which significantly reduces energy consumption per ton of steel (Chart 3-7 right). Ansteel also uses blast-furnace gas to generate electricity, and built IGCC generator units.

Thanks to a series of energy-conserving measures, Ansteel achieved energy conservation of 2.68 million tons of standard coal equivalent from 2006 to 2009 by reducing comprehensive energy consumption per ton of steel by 1,360 kilograms of standard coal equivalent. In the end, Ansteel exceeded its target of conserving energy of 2 million tons of standard coal equivalent a year ahead of schedule.

Chart 3-7 Ansteel's Newly built Highly Efficient Steel Plant and New Processing Line

2. Low-carbon Layout

Urban spatial layout defines its transportation system, and also affects the energy efficiency of its infrastructures and related building energy consumption. Due to the "lock-in" effects of the infrastructures, once cities and townships or districts grow and define their urban shape, it is very difficult to rebuild. As a result, low-carbon layout only applies to new cities and towns or districts.

Low-carbon layout has become an important part of China's urban planning and construction. In December 2010 in the Notification on Issuing National Plan for Development Priority Zone, the State Council proposed "upholding the development idea of developing in accordance with the environmental bearing capacity of resources, controlling the development intensity and adjusting the spatial structure" to "build low-carbon cities and reduce greenhouse gas emission intensity".

Case 1: Comprehensive Layout of Energy, Functions and Transportation--Sino-Singapore Tianjin Eco-city

As a strategic cooperation project between the governments of Singapore and China, Tianjin Eco-city is a new ecologic city (Chart 3-8, right) built on the site of non-arable salt-pan and saline-alkali soils (Chart 3-8, left). Through comprehensive planning of its urban layout, urban industries and transportation system, the eco-city is designed to become an advanced ecological and energy conserving model city.

Chart 3-8 Abandoned Salt Pan Before the City Was Built and the Carton Park Built on the Site

Chart 3-9 Sino-Singapore Tianjin Eco-City Urban Spatial Planning (Left) and Industrial Planning (Right)

Employing the principle of economical and intensive land use, Sino-Singapore Tianjin Eco-city adopted a pattern of compact urban spatial layout. The city is divided into various functional areas in accordance with the ecological and geographic features of each area (Chart 3-9, left). Each functional area develops low energy consuming service industry as its supporting industry (Chart 3-9, right).

Through urban spatial planning, Tianjin Eco-city has built a green transportation system with public transit lines as its "bones" (Chart 3-10, left) and a slow traffic system as its "blood vessels" (Chart 3-10, right), which reduces the demand for motorized trips to the maximum extent possible.

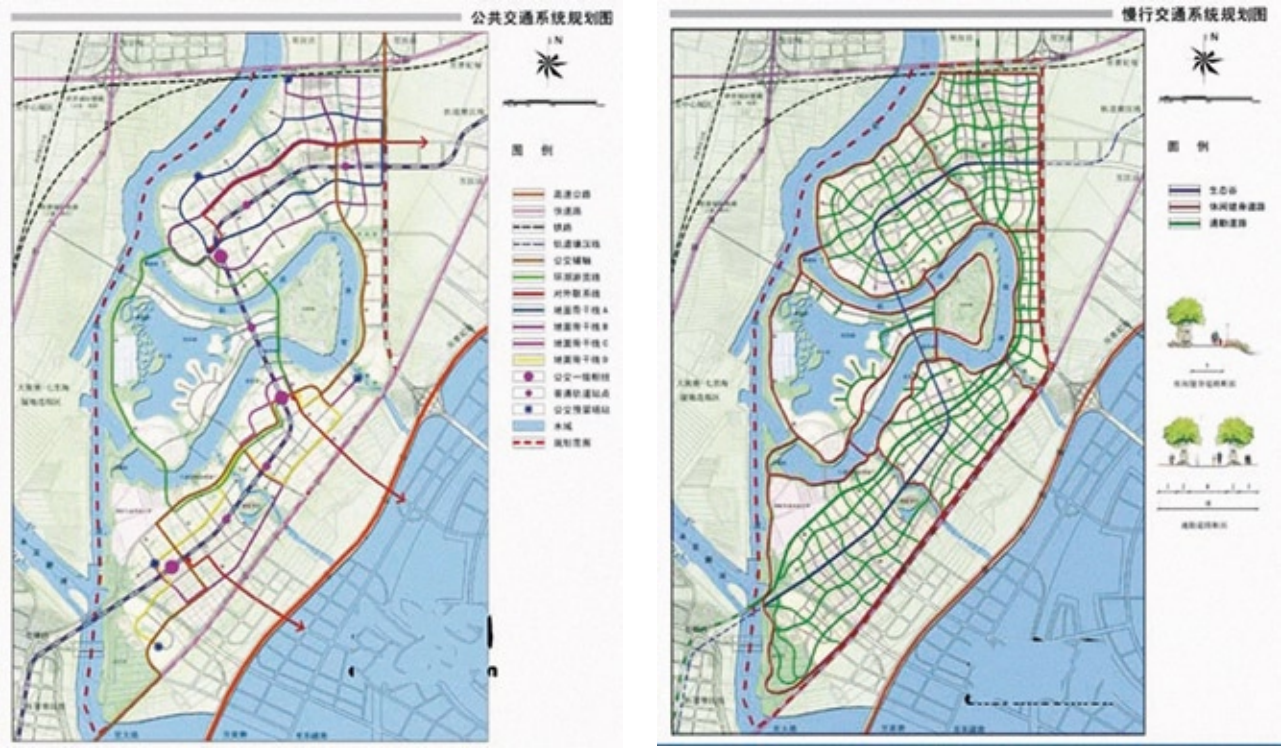

Chart 3-10 Sino-Singapore Tianjin Eco-City Public Transportation System (Left) and Slow Traffic System (Right)

Case 2: Low-Carbon Layout and Low-Carbon Construction--Tianjin Yujiapu Financial District

Located in the Binhai New Area of Tianjin municipality, Yujiapu Financial District is positioned as a home for high-end financial industries. Having started in 2008, the construction of the district is expected to be complete in eight to 10 years. Man power and material resources have been invested in the spatial layout planning of the new-built financial district to enhance its spatial utilization, optimize the distribution of functional areas and energy layout, enhance energy utilization efficiency and reduce energy consumption in transportation, which are reflected as follows:

1). Green ecological buildings: these buildings are designed with rain water management systems, regional energy-storage air conditioning systems, distributed power-supply systems, energy-conserving curtains, renewable energy strategy, green plant roofs, etc. It specified an are of green space of at least 30%.

2). Development of subway rail transit systems: The financial area plans to have buildings connected directly with subway passages and spaces. Subway rail transit systems will be linked with high-speed rail connecting Tianjin and Beijing.(Chart 3-12)

3). Centralized supply of cooling and heating: it is likely to save 30% - 35% energy use by utilizing underground space on urban grassland to house “cooling centers”, cooling the buildings concentrated in the region. In addition, the

financial district will try to comprehensively utilize low-carbon energy sources and technologies, such as urban power plant waste heat, as well as peak power and ice storage to plan and design a number of energy centers within the region. It is going to maximize the intensive use of energy and land, providing green energy to the financial district.

4). Low-carbon construction: in order to avoid unnecessary energy consumption caused by the construction, demolition and reconstruction of temporary housing for construction workers, the area has built its own Home of Builders (Chart 3-13), a permanent and professional complex which provides comfortable and energy-conserving office and living facilities for construction workers.

Chart 3-11
The Long-term Planning Map of Yujiapu Financial Area

Chart 3-12
The Planning of Yujiapu Financial Area Subway Rail Transit

Chart 3-13 Map and Bubuildings of Yujiapu Financial District Home of Builders

3. Low-carbon Energy

Urban carbon emission is closely related to energy exploitation and utilization technologies. China develops its low-carbon energy in the following areas: i). Nuclear energy and renewable energy development; ii). Increased fossil energy conversion efficiency and developing carbon capture and sequestration technologies; iii). Developing smart grid and related networks.

The Chinese central government implements a series of policies that strongly promote the development of low-carbon energy. For example, in the area of developing renewable energy, China implemented the Renewable Energy Law. In accordance with the requirements of the law, the NDRC in the same year issued Trial Measures for the Administration of the Pricing of, and the Sharing of Costs in Connection with, the Generation of Electricity Using Renewable Energy Resources, and Interim Measure on Allocation of Income from Surcharges on Renewable Energy Power Prices. Thus China established a cost-sharing system in connection with generation of electricity using renewable energy resources. The additional renewable energy tariff was set on a level of 0.000157 dollar/kWh in non-agricultural sectors (starting from June 2006). In the same year, the Ministry of Finance issued Interim Measures on Special Fund Management for Development of Renewable Energy. In 2007, the NDRC and SERC jointly issued the Circular on Renewable Energy Electricity Price Subsidies and Quota Trading Schemes, thus establishing renewable energy electricity price subsidies and quota trading schemes for the first time in China. In 2008, the Ministry of Finance issued its Interim Measure on Management of Special-Project Funds for Industrialization of Wind Power Generation Equipment, and Interim Measures for Management of Use of Straw Energy-oriented Subsidy Funds. And in 2009, the Ministry of Finance issued Interim Measures for Use of Public Finance Subsidy Funds Management for Solar Photovoltaic Use in Buildings, and Notice on the Management of Construction of Golden Sun Demonstration Projects and Solar-PV Building-Application Demonstration Projects. In April 2010, Amendments to the Renewable Energy Law took effect, which further stipulate supporting policies concerning renewable energy resources exploitation, planning, scientific research, industrial development, investment, pricing and tax.

As to energy efficiency, the State Council issued its Circular on Several Opinions on Accelerating the Closure of Small Thermal Power Generation Units, which formulates the implementation measures necessary for shutting down small thermal power generation units. In the same year, China revised its Energy Conservation Law, stipulating that energy conservation is a basic national policy.

Thanks to these policies, China has made significant breakthroughs in the development of low-carbon energy, with rapid growth in nuclear and renewable energy and the significant enhancement of fossil energy conversion efficiency.

Development of China's Low-carbon Energy

Wind Power Station in Juqan

Wind Power: In 2010, China added 18.9 GW of new wind power capacity (including 15GW of grid-connected capacity), bringing the total installed capacity up to 44.8 GW (including 31GW of grid-connected capacity), 127 times that of 2000 (Chart 3-14). China's newly added installed wind power capacity and total installed capacity rank first in the world.

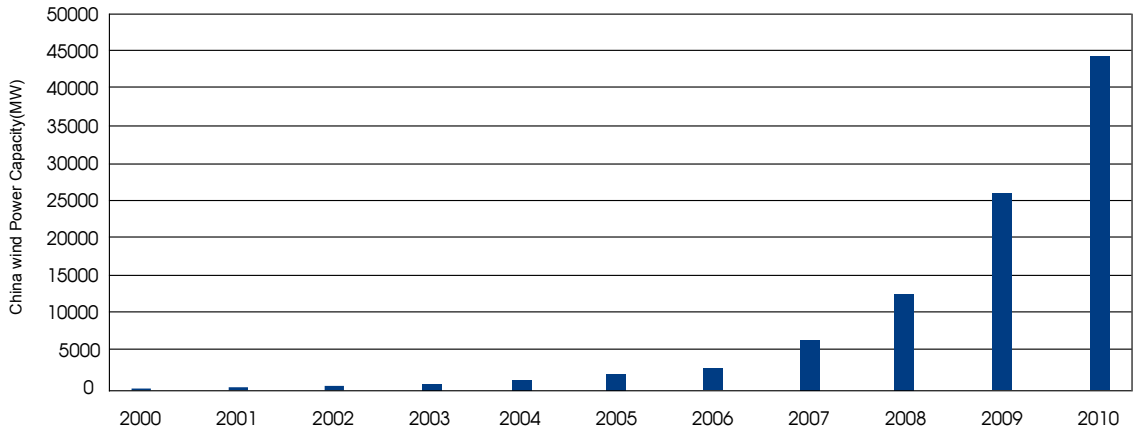

Chart 3-14 China's Installed Wind Power Capacity from 2000 to 2010

PV Station in Yunan

Solar photovoltaic power generation: in 2010, China reached a total installed solar capacity of 893 MW, 47 times that of 2000 (Chart 3-15), and its solar cell production hit 8 GW, accounting for 50% of global cell production. To promote the development of solar photovoltaic power generation, the Chinese government launched in 2009 the Golden Sun plan and solar rooftop project, and gave special approval to 13 photovoltaic power station projects, bringing the total capacity under construction up to 1000 MW.

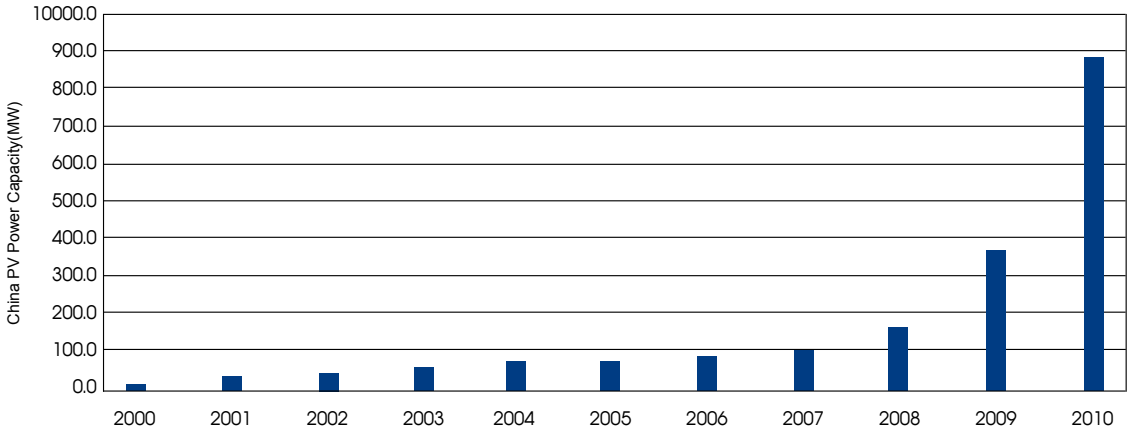

Chart 3-15 China's Installed Photovoltaic Capacity from 2000 to 2010

Roof Solar Water Heater

Solar water heaters: In 2009, China's annual solar collector production reached 42 million square meters, accounting for nearly 60% of the world total. And the quantity deployed was approximately 168 million square meters, accounting for 80% of the global total.

Methane Tank

Methane: China built approximately 4,000 large and medium-sized methane projects and about 60,000 small methane projects in rural areas in 2010. Nearly 40 million rural households use methane gas, involving about 150 million people.

Tianwan Nuclear Station

Nuclear Power: In 2010, China put into operation 13 nuclear power generating units, with an installed capacity of about 10.8 GW. China has 24 nuclear power generating units under construction, which will bring the total installed capacity up to 31 GW, ranking first in the world in terms of the scale of nuclear power projects under construction.

Yuhuan Ultra Supercritical Coal-fired Units

High-efficiency Coal-fired Power Generation Technology: by developing advanced supercritical and ultra supercritical coal-fired units and phasing out inefficient small units, China has witnessed further improvement of the efficiency of coal-fired power generation and a sustained reduction in coal consumed for power supply (Chart 3-16). By the end of 2010, with more than 150 600MW super critical units and 1000MW ultra supercritical units in operation, under construction or being ordered, China ranks first in the world in terms of the scale of newly built supercritical and ultra supercritical units.

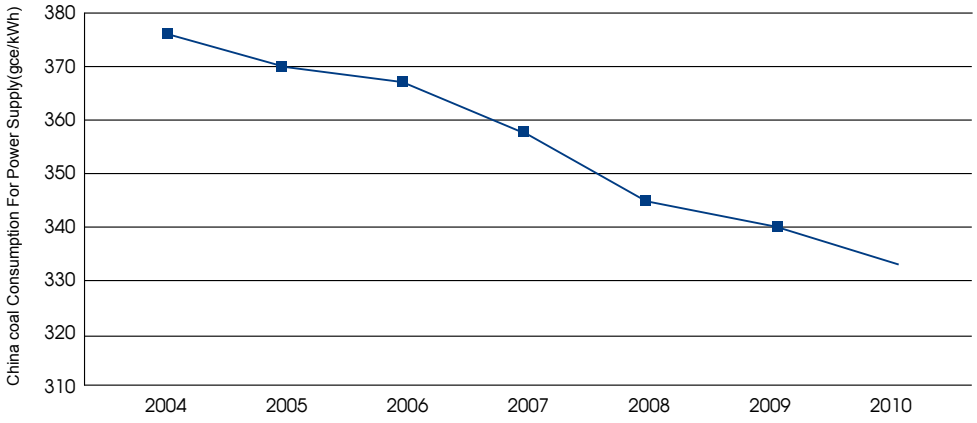

Chart 3-16 China's Average Coal Consumption for Power Supply from 2004 to 2010

Chian Huaneng GreenGen

Integrated Gasification Combined Cycle (IGCC): IGCC is a clean, highly efficient and advanced coal-fired power generation technology that unites gasification technology with a gas-steam combined cycle. In 2009, China Huaneng Group started the construction of China's first 250MW-class IGCC unit, which is expected to enter operation at the end of June 2012. This coal-fired power generation unit is designed to ultimately achieve near zero carbon emission with the introduction of carbon capture and sequestration technologies.

Shanghai Shidongkou Power Plant

Carbon Capture and Sequestration(CCS): China launched the following CCS demonstration projects which focused on capturing carbon dioxide emissions caused by coal consumption: the pre-combustion capture technologies demonstrated by the Tianjin IGCC power plant (under construction); the post-combustion capture technologies demonstrated by Beijing Gaobeidian power plant (with an annual capacity of capturing 3,000 tons of carbon dioxide) and the Shanghai Shidongkou No.2 power plant with an annual capacity of capturing 100,000 tons of carbon dioxide; and China's first full CCS process model project of the coal liquefaction plant built in Erdos, Inner Mongolia (carbon dioxide sequestration in saline aquifers).

Smart Grid Simulated Diagram

Smart Grid: by applying sensing, measurement, control and decision-making systems, smart grid technologies achieve power grid intellectualization and enable them to operate in a reliable, safe and low-carbon way. China has set "developing a strong and smart grid in an all-around way" as one of its strategic objectives of power grid construction. In September 2010, China's first urban integrated smart grid demonstration project located in Sino-Singapore Tianjin Eco-city was put into operation.

Case 1: Civil Solar Technologies: Dezhou in Shandong Province

Located in the northwest part of Shandong province, Dezhou enjoys relatively rich solar resources. The average annual sunshine duration is 2,592 hours, rate of possible sunshine 61% and total amount of solar radiation 124.8 kilocalorie per square meter. The city is harnessing this rich solar energy and is vigorously developing the following civilian solar technologies:

1). Rooftop solar water heaters: the city launched the "a million rooftops" plan to install rooftop solar water heaters as well as wall-mounted heaters (Chart 3-17). By the end of 2010 solar water heaters were installed in 95% of new urban communities and in 50% of towns. The floor area of buildings installed with solar water heaters amounts to over 10 million square meters, with that of solar collectors up to over 600,000 square meters.


Chart 3-17 Rooftop Solar Water Heaters (Left) and Wall-mounted Solar Water Heaters

2) Solar photovoltaic demonstration projects: the city has installed solar energy traffic signal lamps, street lamps and landscape lamps (Chart 3-18). Now Dezhou has 80 solar energy traffic signal lamps, and its 50 roads and 15 key scenic sites have been installed with solar energy street lamps and landscape lamps. The total length of streets installed with solar street lamps amounts to 137 kilometers.

3) The BIPV (building-integrated photovoltaic) projects: Dezhou now installs photovoltaic power generation systems on roofs to supply buildings with daily power (Chart 3-19). Dezhou has a total planned installed photovoltaic capacity of up to 50MW, with 33kW photovoltaic power generation systems in operation and 256kW power units under construction.

Chart 3-18 Solar Lamps Along the Streets of Dezhou

Chart 3-19: The Operation of 33kW Photovoltaic Power Generation System Installed in a Residential Community in Dezhou.

Case 2: Wind Power and Solar Power Generation Base- Hami in Xinjiang Province

Located in the northwest of China, Hami is a city with 75GW of exploitable wind power resources and annual sunshine duration of 3,380 hours. It has been designated as one of China's seven 10 million kW -class wind power generation bases. In 2011, its installed wind power generation capacity under construction amounted to 1.65GW, and its total installed wind power generation capacity will reach 6GW in 2015. Hami also completed the construction of a 20 MW photovoltaic power station at the end of 2011.

Chart 3-20: Wind Farm (left) and Photovoltaic Power Station in Hami

4. Low-carbon Building

Building is a major source of China's urban energy consumption, especially in business districts. In order to promote building energy conservation, the Ministry of Housing and Urban-Rural Development (MOHURD) issued the Design Standard for Energy Efficiency of Public Buildings in 2005, and jointly with the Ministry of Science and Technology issued a Green Buildings Evaluation Standard. In the Code for Acceptance of Energy Efficient Building Construction promulgated in 2007,MOHURD specifically stipulated building energy efficiency as a divisional work, and energy conservation as a compulsory standard of unit construction completion acceptance. In the same year, the State Council released the Comprehensive Work Plan for Energy Conservation and Emission Reduction which stipulated that all the 25 provinces and municipalities should establish large-scale public building energy consumption statistics, energy auditing, energy efficiency public-noticing and energy consumption ration systems, and reach the goal of energy conservation of 12.5 million tons of standard coal equivalent. In 2008, the State Council issued the Regulation on Energy Conservation in Civil Buildings and Energy Conservation Regulation for State-funded Institutions that stipulates that all state office buildings and large-scale public buildings should be subject to energy consumption measurement and energy auditing, and local governments at and above the country level should set public building power consumption limits. Also in these two regulations, the State Council set the goal of energy conservation by 20% during the 11th Five-year period. In August

2011, MOHURD issued the 12th Five-Year Development Plan for the Construction Industry which set the goal of reducing construction energy consumption per unit of added-value by 10%, and of the engineering design of all new projects and the construction of new projects meeting the national construction energy conservation standard.

Case 1: Building Energy Efficiency Monitoring Platform-Shanghai Hongqiao Economic Development Zone

Home to many business offices, large-scale exhibition buildings, hotels, commercial residential buildings and similar structures, Shanghai Hongqiao economic development zone's buildings account for over 80% of its total energy consumption (with the exclusion of transport energy consumption). In order to enhance the energy efficiency of existing buildings, Changning Hongqiao district set up a building energy efficiency monitoring platform that conducts on-line and real-time monitoring (Chart 3-21) of appliances' energy consumption in its existing buildings, and modifies and optimizes energy use of those appliances whose misuse or overuse may cause energy waste.

This building energy efficiency monitoring platform mainly monitors the following equipment and appliances: air-conditioning systems and their supporting devices, elevator power equipment, lighting equipment and office appliances (Chart 3-22). By acquiring in real time actual operating data of energy-consuming appliances, this platform can adjust and optimize energy-consuming equipment in the following three manners and thus achieve the goal of energy conservation and emission reduction: Firstly, identify electromechanical equipment that starts and runs by mistake; Secondly, identify equipment that is under loaded or overloaded due to controlling or matching problems; And finally, optimize equipment units in line with actual building demand.

Chart 3-21: The Interface of Hongqiao Building Energy Efficiency Real-time Monitoring Platform

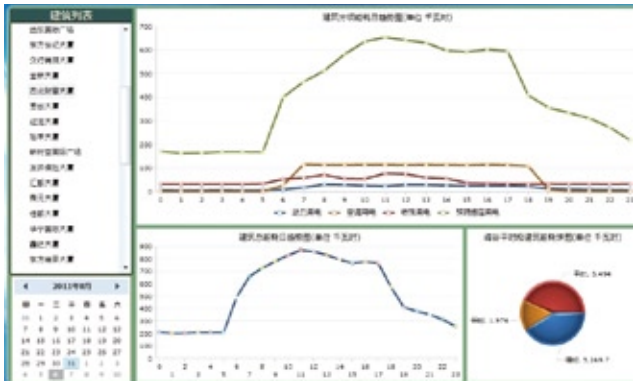

Chart 3-22: Monitoring Chart of Energy Consumption of Major Appliances and Equipments in Existing Buildings Located in Hongqiao

The energy efficiency monitoring system has been installed in 45 buildings in Hongqiao. The actual operation results showed that there had been to a greater or lesser extend defects in the management of energy consumption of equipment and appliances in all the buildings. The platform modifies the energy consumption management system and reduces building energy consumption by 5% to 10%. With further optimization and improvement of the operating mode of the equipment units, the buildings' energy consumption can be reduced by approximately 30%.

Case 2: Ultra Energy Efficient Demonstration Building-- Tsinghua University

In March 2005, Tsinghua University became home to the Ecological Energy Efficient Building (SIEEB), China's first ultra energy efficient demonstration building. With a floor area of 20,268 square meters, SIEEB adopted 80% of the energy efficient technologies in the world at that time. SIEEB can save about 70% more energy than other buildings of the same scale in China.

With the use of vacuum glass as its exterior walls (Chart 3-23, left), which creates a "thermos effect", this building is highly heat preserving, thermal insulating, sound insulating and condensation preventing. This building features a self-cleaning oxide-nanofilm-coated glass roof that breaks down organic substances on the glass using ultraviolet light and makes it difficult for inorganic substances to adhere to.

Some curtain walls of the south and north facades adopt smart sun-shading louver systems (Chart 3-23, right), which can automatically regulate the angle of the slates in accordance with the sun angle. In summer, the system can block out unwanted direct sunlight and let in some of the reflected sunlight and scattered light for indoor daylight, while in winter the louvers are set parallel to the sunlight to let in as much as possible.

Chart 3-23: SIEEB's Vacuum Glass and Smart Louver Shading Device

Its first floor ceiling is densely covered with water circulating plastic tubes 6 mm in diameter. With the water temperature maintained at 32℃ in winter and 18℃ in summer, this radiant ceiling can avoid discomfort caused by direct exposure to air conditioning, and thus make the building more comfortable. With the usage of special phase-changing material as heat accumulators, the floor in the building can absorb heat in the day and release it at night, thus saving energy that could have been used for heating in winter. Furthermore, some floor is covered with small ventilation holesthat let in fresh outdoor air. The energy efficient building's rooftop green belt (Chart 3-24, right) and atrium garden pool (Chart 3-24, left) improve the rooftop environment and enrich the building's appearance, and at the same time purify rainwater and sanitary wastewater.

Chart 3-24: Tsinghua Energy Efficient Building's Atrium Pool (Left) and Rooftop Garden (Right)

Case 3: Laws and Regulations on Building Energy Conservation and Demonstration Projects—Zhuhai, Guangdong Province

In a bid to reduce urban building energy consumption, Zhuhai city promulgated in 2009 the Zhuhai City Building Energy Efficiency Measures that puts forward requirements on buildings' low-carbon construction, energy saving renovation and renewable energy deployment. It also stipulates that all the new buildings should be subject to building energy efficiency assessment and examination. The Zhuhai Building Energy Efficiency 12th Five Year Planning issued recently sets the goal of all of its new residential building meeting the national energy efficiency standard by 2015.

In a bid to promote its building energy efficiency development, Zhuhai municipal government put forward a public building energy saving renovation program and set up a special energy conservation and emission reduction fund. And with the application of technologies such as energy-saving walling, hollow thermal insulation glass, energy-efficient lighting and solar-assisted heat pump water heaters (Chart 3-25), Zhuhai municipal government renovated public buildings such as Zhuhai Press Building and Zhuhai No. 1 High School. These measures helped reduce public building energy consumption and drove the development of construction energy conserving technologies.

Chart 3-25: New Building's Solar Water Heater System and Geothermal Heat Pump System in Zhuhai

5. Low-Carbon Transportation

Confronted with growing urban transportation energy consumption, the Chinese government has advocated measures such as low-carbon travel, vigorous development of public transportation, improvement of fuel economy and development of green cars in a bid to effectively reduce its urban transportation energy consumption.

In September 2005, the Ministry of Construction, NDRC, Ministry of Science and Technology, Ministry of Public Security, Ministry of Finance and Ministry of Land and Resources jointly issued the Opinions Concerning Giving Priority to the Development of Urban Public Transport. In December 2006, the Ministry of Construction, NDRC, Ministry of Finance and Ministry of Labor and Social Security jointly issued the Opinions Concerning the Economic Policy on Giving Priority to the Development of Urban Public Transport. In Regulations on Urban Public Transport (Draft for Comment) issued in October 2010, the Legislative Affairs Office of the State Council explicitly proposed that China should increase its capital investment in public transport, give priority to developing urban public transport and ensure its leading role in urban transport.

In terms of fuel economy, the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) and National Technical Committee of Auto Standardization (NTCAS) approved and issued Standards on Passenger Vehicle Fuel Consumption Limits, China's first mandatory standard on fuel economy, which adopted phase-in implementation by two steps, and classified the vehicles into different groups by weight and set uniform limits for vehicles at the same weight level. In 2007, Fuel Consumption Limits for Light Duty Commercial Vehicles was released. As China's first national standard on fuel economy of commercial vehicles, it set the light-duty commercial vehicle limits based on "vehicle total weight + engine displacement". Meanwhile this standard adopts differential limit standards for gasoline vehicles and diesel vehicles. In 2009, the Consumption Evaluation Method and Targets for Passenger Vehicles was ratified, which further modifies "Passenger Vehicle Fuel Consumption Limits". This standard sets fuel consumption targets for vehicles of different weight levels. It also sets average fuel consumption goals for enterprises on a production weighted average basis. In June 2010, the Ministry of Transport launched 1,000 Enterprises' Low-carbon Transportation Special Action of

Nationwide Vehicles, Ships, Roads and Harbors, which comprehensively advances energy conservation and emission reduction in line with the characteristics of different sectors.

The Chinese government is also intensifying its efforts to develop green cars. In 2009, it launched the "10 cities, 1,000 vehicles" green car demonstration, promotion and application project. This project lasts for three years. Each year, 10 new cities receive subsidies for 1,000 new energy vehicles respectively for pilot running. The program aims to raise the share of new energy vehicles to 10% of the total auto market by end-2012. Now 25 cities participate in this program.

Case 1: Low-carbon Travel--Xi'an city, Shaanxi Province

In order to promote green lifestyle and public environmental awareness, the Xi'an municipal government hosted China's 4th Car-Free Day as well as 1,000 people walking (Chart 3-26), calling on its citizens to choose low-carbon travel options such as cycling or walking over car driving, and to live a low-carbon life to protect the environment.

Case 2: Public Bicycle Service System--Hangzhou, Zhejiang Province

Located on the southeast coast of China, Hangzhou city is a renowned historic city and tourist destination with beautiful scenic spots. It is the second-largest city of the Yangtze River Delta in terms of economy, and also the political, economic and cultural centre of the south of the delta.

As part of efforts to address traffic congestion and pollution problems, Hangzhou became the first city in China to launch a public bicycle service system in 2008. Its residents can apply for a transportation smart card for free. With this card, one can rent or return a bicycle at any bike-sharing station (Chart 3-28, left). There are electric bicycle transporting carriers exclusively dedicated to ensuring a reasonable distribution of bicycles among the bike-sharing stations (Chart 3-28, right). Now the service operates over 50,000 bicycles and 2,050 bike-sharing stations, with an average daily use of 250,000 journeys.

Chart 3-26: China's 4th Car-Free Day (left) and "1000 People Walking" (Right) Hosted in the City of Xi'an

Chart 3-27:
A Public Bike-Service Station in Hangzhou

Chart 3-28:
A Public Bike-Service Card-Server (Left) and Bicycle Transporting Carriers (Right)

Case 3: Low-carbon Public Transit System--Dalian in Liaoning province

Dalian city is dedicated to building a low-carbon urban public transit system. In 2008, the first Bus Rapid Transit route in Northeast China was open to traffic in Dalian. And the city also has built four transportation hubs, 170 bus bays and 12 bus lanes with a total length of 56 kilometers. Thanks to those efforts, there are now 24 standard buses per 1,000 people in Dalian, 41% higher than the national standard of 17 standard buses; its public transportation ridership reaches 2.1 million trips per day. Over 45% of its residents choose to travel via public transportation. Now Dalian has 248 new energy public transport vehicles in operation, including 222 hybrid electric vehicles (Chart 3-29, right) and 26 electric vehicles. It has also added low-emission diesel buses and LNG (liquefied natural gas) buses to its public transport fleet.

Thanks to its vigorous efforts to develop urban light rail (Chart 3-30, left), the total rail length open to traffic amounts to 88 kilometers, accounting for 5.9% of its public transport mileage. And its average light rail ridership reaches 204,000 trips per day, accounting for 8.2% of the average total public transport ridership per day. With several rail transit lines under construction, Dalian aims to build a three-dimensional public transit system, with rail transit as the backbone and buses as the supplement (Chart 3-30, right).

Chart 3-29: Bus Lane (Left) and Hybrid Electric Bus in Dalian (Right)

Chart 3-30: A Light Rail Train in Dalian (Left) and Lts Urban Rail Transit Planning Map (Right)

Case 4: Electric Vehicles--Shenzhen in Guangdong Province

Chart 3-31: An Electric Vehicle Charging Station And Electric Cars in Shenzhen

Located in the southeast coastal area of China, Shenzhen city is China's first special economic zone with a population of over 10 million. In 2010, the share of the tertiary sector in Shenzhen's economy reached 52.7% and its energy consumption per 100,000 Yuan in GDP was only 0.51 tons of standard coal, only half of the national average and approximately the level of Singapore and the Republic of Korea.

Furthermore, Shenzhen gives priority to the development of electric vehicle industry, which it sees as its principal new energy industry, and began massively promoting new energy cars around the city (Chart3-31). The city is expected to have over half of its buses replaced with electric buses by the end of the 12th Five-Year Plan Period.

6. Resources Recycling

With rapid economic growth, industrial and domestic waste increases dramatically. A proactive approach to resources recycling and utilizing and energy utilization efficiency enhancement will positively affect urban low-carbon development.

In 2008, China promulgated the Circular Economy Promotion Law, which proposes the promotion of reducing, reusing and recycling activities in the process of production, circulation and consumption to readjust energy-intensive, high-emission and energy-inefficient economic growth models.

Many of the surveyed cities and towns have adopted technologies such as waste recycling, metallurgical waste heat and waste pressure utilizing as an important part of their low-carbon development efforts.

Case 1: Public Service Platform of Renewable Resources Recycling--Shanghai Jinqiao Export Processing Zone

Located in the north of Pudong New Area, Shanghai Jinqiao Export Processing Zone is a comprehensive development zone with advanced manufacturing industry and producer services. In a bid to reduce energy consumption and carbon emission, Jinqiao Export Processing Zone gives high priority to recycling and utilization of its industrial and domestic waste. In the course of its development, the social renewable resources recycling industry came across some obstacles (table 3-3) relating to waste reclaiming, treatment and recycling. Taking into consideration these obstacles, the zone adopts an innovative business model and sets up a renewable resources recycling public service platform that integrates e-commerce, Internet of Things and production outsourcing.

Table 3-3 Obstacles to Social Renewable Resources Recycling

Obstacles	Content
Transportation and labour costs	How to solves the problems faced by domestic wastes recycling work that features low-volume, high-frequency and wide-distribution
Treatment process	How to provide professional and high-standard treatment technologies, enhance recycling efficiency and prevent secondary pollution
Reclaiming methods	How to make it convenient for enterprises and individuals
Image and publicity	How to build a green image and encourage active public participation

This public service platform of renewable resources recycling consists mainly of a recycling platform and recycling spots, and is dedicated to recovering electronic waste. The platform provides its user with a free "Ala environment-protection card" and bar code stickers. All the users have to do is to put bar code stickers on electronic waste, take them to the nearby recycling spots and drop them into renewable resources recycling bins. When filled up, these infrared-sensing bins will automatically alert the recycling platform (Chart 3-32) to reclaim the waste. Then the platform will scan the bar codes on the reclaimed waste, convert them into credits according to type of the waste and deposit these points in users' Ala card account. Users can redeem these points for either cash or shopping in contracted supermarkets or shopping malls.

As shown in Chart 3-33, the public renewable resources recycling platform operates with this innovative business model that significantly reduces resources recycling cost and labor cost and reduces the transportation cost by 80%. With waste reclaiming outsourced to local logistics companies, it only takes 30 people to operate and manage the whole platform.

Since its launching in June 2010, the public renewable resources recycling service platform has had over 65,000 registered members and has the capability of reclaiming over 700,000 units of electric waste every year. The platform

mainly serves Pudong New Area at present, but there are plans to expand to the streets of other districts of Shanghai and even other areas of the Yangtze River Delta. This system is estimated to be capable of treating and disposing of about 10 million electronic waste items in the future. And this renewable resources recycling platform will reclaim other renewable resources such as waste paper, glass, plastics and scrap metal, amongst others.

Chart 3-32: Real Time Monitoring of the Renewable Resources Recycling Platform's Recycling Bins Alerting

Chart 3-33 Waste Recycling Process Diagram of the Renewable Resources Recycling Platform

Case 2: Heavy-Industry Waste-- Wuhan Hubei Province

As an important heavy industrial city in the center of Central China, Wuhan is typical of a majority of the Chinese heavy industrial cities in terms of development. In a bid to achieve energy conservation and emission reduction, the Wuhan municipal government is vigorously developing a circular economy structure, and recycles industrial waste produced by heavy industries such as steel, petrochemical and electric power.

For example, coal gas produced by steel mills is now supplied to chemical plants and thermal power plants, and slag supplied to cement plants and construction material companies (Chart 3-34). Petrochemical industry waste gas is desulfurized and utilized as fuel with by-products such as waste residue and sulfur supplied to construction companies. As for thermal power plants, their lime-ash can be used as construction or paving material, the desulfurized by-product as material for producing commercial plaster and denitrated by-product as materials for producing urea and ammonia.

Chart 3-34: Slag (Left) and Bricks (Right), Wuhan City

IV. International Cooperation of China's Low-carbon Town Development

International cooperation has played an active role in promoting and facilitating China's low-carbon town development. In recent years, the international cooperation of China's low-carbon town development has continued to deepen, which is reflected in 1) continuously broadening the scope of cooperation; 2) constantly improving the cooperation mechanism; 3) regularly introducing advanced international concepts.

1. Continuously Broadening the Scope of Cooperation

The international cooperation scope of China's low-carbon town development is continuously broadened, which is firstly reflected in the continuous expansion of partners. There are multilateral cooperation initiatives among governments, e.g. the low-carbon town development cooperation under the APEC framework; there are also bilateral cooperation between governments, such as the Sino-Singapore Tianjin Eco-City which is a flagship cooperation project between the governments of Singapore and China, there is also the "low-carbon economy methodology and low-carbon economic zone development case study" project which is launched together with the British government under the framework of the national climate change strategic cooperation, and "Sino-Swiss low-carbon eco-city projects" carried out with the Ministry of the Environment.

Secondly, areas of cooperation are continuously broadened. At present, it has become a trend and a main direction of international cooperation to comprehensively cooperate on and jointly launch low-carbon model town pilot projects. For example, Yujiapu Financial District in Tianjin, APEC's first low-carbon model town project, includes international cooperation areas covering its low-carbon evaluation index system, transportation system, underground space planning, regional energy supply, green building, heat island effect analysis, energy efficiency management and low-carbon construction, as well as other aspects.

2. Constantly Improving the Cooperation Mechanism

Here we take the low-carbon town development cooperation under the framework of APEC as an example. After initially being proposed to the Energy Working Group (EWG) and discussion at the leaders' meeting and the low-carbon model town forum, its cooperation mechanism has been constantly improved. In June 2010, China and Japan jointly launched a low-carbon model town project on APEC Energy Ministerial Meeting, selecting Yujiapu Financial District in Tianjin as the first model town; in July 2010, the APEC Low-carbon Model Town Working Group (LCMT) was formally established at the first meeting of the APEC Low-carbon Model Town Working Group. In November 2010, low-carbon town development was introduced to the APEC leaders' meeting as an important item; In May 2011, the second meeting of the APEC Low-carbon Model Town Working Group adopted the LCMT Action Plan, establishing two expert sub-groups responsible for APEC economies' low-carbon town research, policies and regulations study, as well as LCMT projects review and advice; In June 2011, the APEC low-carbon model town forum was held in Tianjin, the APEC Low-carbon Model Town Working Group and participating experts discussed the concept, pattern, policy and measures, and energy planning of low-carbon towns.

3. Regularly Introducing Advanced International Concepts

Through extensive international cooperation, the development of China's low-carbon towns fully absorbed international advanced planning and design concepts. For example, the first case of APEC low-carbon model town, Yujiapu Financial District in Tianjin, invited design teams from various economies to carry out planning and design. After a year of operation, the project team conducted in-depth study on the concept of a low-carbon town, and drafted a feasibility report based on it.

In another example, based on sustainable urban function, ecological environment, energy utilization, solid waste disposal, water resources management, green transportation and building design (Figure 4-1), the Sino-Swedish low-carbon eco-city project is designed to take the lead on completing eco-city construction in three to five years, making it a low-carbon eco model project of international influence through learning concepts and successful experiences of advanced eco-cities in Sweden, taking into consideration Wuxi's natural, social and industrial practice.

In addition, China has also made progress on the study of international cooperation on the index system of low-carbon town development. On March 19, 2010, the Jilin Low-carbon Development Plan was officially issued as a result of "the development of low-carbon economy methodology and low-carbon economic zone case study" program (Figure 4-2). It was an important result of the plan to develop a measuring index system of low-carbon economy, including carbon productivity, consumption model, energy structure and low-carbon policies.

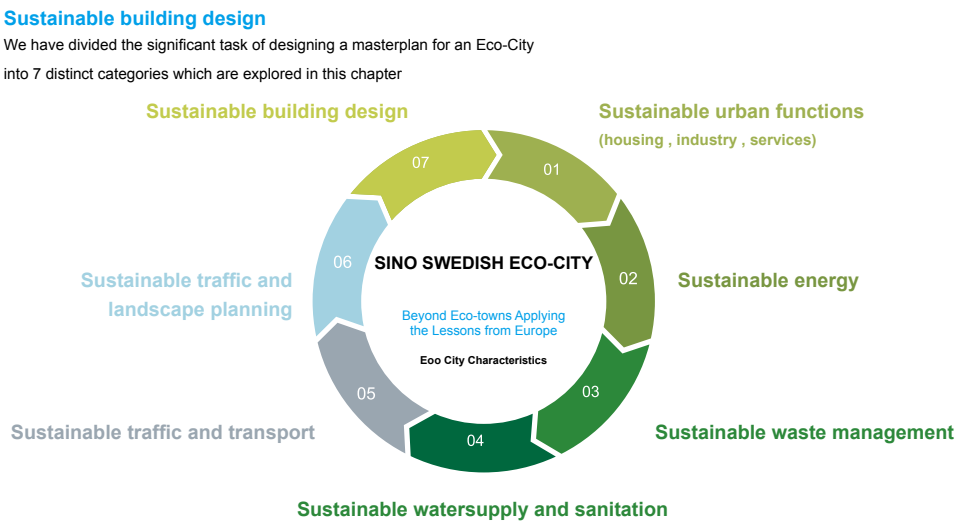

Chart 4-1: Seven Sustainable Development Goals of Sino-Swedish Low-carbon Eco-city

Chart 4-2: Cover of Jilin Low-carbon Development Plan

V. Conclusions

The economy in the Asia-Pacific region is gradually recovering from the global financial crisis, but future economic development is still quite uncertain, while urbanization is facing an increasing number of challenges regarding energy supply and climate challenge. China and other APEC economies are faced with both development opportunities as a result of urbanization, as well as complex energy and environment challenges. Therefore, APEC economies should cooperate more strongly to deal actively with climate change and to promote the development of low-carbon town projects.

Towns have become the main body of China's energy consumption and carbon emissions. The Chinese government has been developing low-carbon towns as a main aspect of its response to global climate change and sustainable development through urbanization, issuing and implementing a series of policy measures to promote low-carbon town development, which have been eagerly taken up by many Chinese cities and towns. With sustainable development as a core concept, China's low-carbon town development is pursuing coordination between the sustainable development of urbanization and carbon emission reduction through integrated use of sic main pathways: low-carbon industry, low-carbon layout, low-carbon energy, low-carbon building, low-carbon transportation and resources recycling. At present, China has plenty of best practices and experiences on low-carbon towns that could serve as model learning material.

In the development process of China's low-carbon towns, international cooperation under the framework of APEC has played an important role in its promotion and facilitation. China will continue to adhere to the concepts of equality and mutual benefit, common and sustainable development, promoting cooperation in the field of APEC low-carbon town development, broadening cooperation areas, innovating forms of cooperation and sharing the fruits of development. It is believed that through the joint efforts of China and other APEC economies, the cooperation on APEC low-carbon town development is bound to develop on a larger scale, in a wider field and on a higher level, injecting new vigor and vitality to the development of APEC economies and making greater contributions to the cause of building a commonly prosperous and harmonious Asia-Pacific region.

References

- BP, 2011. Statistical review of world energy 2011.
- IEA-International Energy Agency, 2010. Energy technology perspectives 2010: scenarios & strategies to 2050.
- Peter P. Rogers, Kazi F Jalal, John A. Boyd, 2006. An introduction to sustainable development. The Continuing Education Division.
- Government of Shijingshan District, Beijing, 2011, Shijingshan District National Economic and Social Development of the 12th Five-Year Plan.
- Chen Weizhen, Lu Yuan, 2010. The framework, routes, and visions for a low-carbon-city: a case study of Shanghai, Beijing: Science Press
- NDRC Energy Research Institute, 2011 China Wind Power circuit diagram 2050
- National Bureau of Statistics, 2011. China Statistical Yearbook 2011, Beijing: China Statistics Press.
- The State Council and the National Development and Reform Commission, 2011. Comprehensive energy reduction program of work of the 12th Five-Year Plan.
- The Lei Hongpeng, Zhuang Guiyang, Zhang Chu, 2011. Feel the pulse of China's low-carbon town development - strategies and methods. Beijing: China Environmental Science out Press
- Mao Qizhi,2011. Megacities Development and Energy Saving: Challenge of China's Urbanization.
2011 World Engineer's Convention.
http://www.wec2011.ch/convention-and-program/presentations/
- Niu Wenyuan, 2011. China New Urbanization Report. Beijing: Science Press
World Wide Fund for Nature (WWF), 2011. Energy Report-A Vision for 100% Renewable Energy by 2050, http://www.worldwildlife.org/climate/energy-report.html.
- Xinhua News Agency, 2011. Authorized to release: the 12th Five-Year Plan for national economic and social development of the People's Republic of China.
http://news.xinhuanet.com/politics/2011-03/16/c_121193916.htm
- Xinhua, 2009. Premier Wen Jiabao's speech at the Copenhagen Climate Change Summit (Full Text).
http://news.xinhuanet.com/world/2009-12/19/content_12668033.htm
- Urban Science Institute of China, 2011. China low-carbon eco-city development report 2011, Beijing: China Building Industry Press.
- Chinese Academy of Engineering, 2011. The research on the mid- and long-term (2030/2050) energy development strategy of China: volume of integration. Beijing, Science Press. In Chinese.
- Ministry of Housing and Urban-Rural Development, 2010. China Urban Construction Statistics Yearbook 2009, Beijing: China Plan Press.
- Zhuang Guiyang, 2008. Low-carbon economy methodology and low-carbon economic zone development case study project held in Jilin. http://kyj.cass.cn/Article/2311.html
- 2050 energy and carbon emissions in China Research Group, 2009. 2050 China energy and carbon emissions report. Beijing: Science Press